BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

In the Matter of the Review of:	**)**	
Unbundled Loop and Switching	**)**	
Rates; the Deaveraged Zone	**)**	**DOCKET NO. UT-023003**
Rate Structure; and Unbundled	**)**	
Network Elements, Transport,	**)**	
And Termination	**)**	

REBUTTAL TESTIMONY OF DOUGLAS DENNEY

ON BEHALF OF

AT&T COMMUNICATIONS OF THE PACIFIC NORTHWEST, INC.

April 20, 2004

I. IDENTIFICATION OF WITNESS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Douglas Denney. I work at 1875 Lawrence Street in Denver, Colorado.

Q. ARE YOU THE SAME DOUGLAS DENNEY WHO FILED SUPPLEMENTAL DIRECT TESTIMONY ON APRIL 9, 2004?

A. Yes, I am.

Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?

A. The purpose of my testimony is to compare and contrast the deaveraging proposals set forth by AT&T, Staff and Verizon and explain why the AT&T approach is the best approach for assigning wire centers to deaveraged zones.[1]

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. There is much agreement among Staff, Verizon and AT&T with regard to the proper methodology of creating deaveraged zones for loop costs. The primary differences lie in the approach parties have taken to assign wire centers to zones. The AT&T approach results in rates that are more cost based than the approach offered by Staff or Verizon, because of two key differences in these approaches. First, the AT&T approach seeks to minimize absolute cost deviations rather than squared cost deviations across the deaveraged zones. Because the purpose of creating deaveraged rates is to ensure that loop costs are more reflective of the underlying cost in each wire center, minimizing

[1] AT&T, Staff and Qwest have entered into a settlement agreement with respect to geographic deaveraging for Qwest and therefore I do not address issues surrounding deaveraged loop rates for Qwest's wire centers.

these actual loop cost differences is the superior method to achieve this aim. This stands in contrast to a method that seeks to minimize the square of the deviations. Second, the AT&T approach compares average deviations relative to the average zone loop cost, rather than simply relying on the deviation by itself. Because high cost wire centers have by their nature higher deviations (whether absolute or squared), taking into account this deviation dependency on underlying costs, will create deaveraged zone costs that more closely reflect the underlying wire center costs. This Commission should adopt the AT&T deaveraging optimizer for creating deaveraged zones for Verizon in Washington.

Q. PROPOSALS FOR DEAVERAGING VERIZON'S LOOP COSTS HAVE BEEN MADE BY AT&T, STAFF AND VERIZON. PRELIMINARILY, ARE THESE APPROACHES SIMILAR IN ANY RESPECTS?

A. Yes. The deaveraging approaches proposed by AT&T, Verizon and Staff are similar in two ways. First, all three proposals arrange wire centers from low loop costs to high loop costs. Second, all three proposals then group these wire centers into deaveraged zones by grouping wire centers with similar costs together. This is precisely the methodology this Commission employed the first time it set deaveraged loop rates. Further, these two steps are the most crucial steps in ensuring that deaveraged loop rates are competitively neutral and representative of their underlying cost.

Q. IN WHAT RESPECTS DO THE PROPOSED DEAVERAGING APPROACHES DIFFER?

A. The deaveraging proposals of AT&T, Staff and Verizon differ in three respects.

First, each party starts with its own set of cost estimates to which it applies a deaveraging methodology. AT&T uses the recommended loop cost estimates as presented in the Supplemental Direct Testimony of Dr. Mercer. Verizon starts with loop cost estimates from their VZ Cost program. Staff uses loop cost estimates based on the HAI Model, but with modified inputs. Though each party starts with its own proposed loop cost estimates, each of the deaveraging methodologies can be applied to any set of loop cost estimates. Thus, the Commission's selection of a deaveraging approach can be independent of the Commission's determination of the appropriate methodology for estimating loop costs.

The second difference is the proposed number of deaveraged zones. Both Verizon and AT&T believe three zones are sufficient. Staff recommends five deaveraged zones, as currently exist in Washington.[2] It should be noted that all three deaveraged methodologies can easily be used to determine costs for both three and five deaveraged zones.

The third, and most significant, difference in the deaveraging methodologies is the method for grouping wire centers into zones. AT&T proposes an algorithm that minimizes the overall weighted averaged deviation divided by the mean for the three deaveraged zones.[3] Staff proposes an algorithm that minimizes the overall weighted "sum of squared errors" across all zones.[4] Verizon proposes a hybrid approach. First Verizon eye-balls the data and looks for significant break points in loop cost by wire

[2] Though Verizon prefers three zones, it does offer a five zone deaveraging proposal. AT&T is not opposed to five zones, though it believes that three zones are sufficient at this time.

[3] See the Supplemental Direct Testimony of Douglas Denney, in this docket, April 9, 2003.

[4] See the Testimony of Dr. Blackmon, February 9, 2004, page 4, lines 11-12.

center. Verizon then divides the remaining wire centers into two zones by minimizing the weighted "sum of squared errors," as is done by Staff.

Q. PLEASE SUMMARIZE THE PROPOSED DEAVERAGING APPROACHES. HOW DO THEY COMPARE WITH THE COMMISSION'S CURRENT DEAVERAGED ZONES?

A. Table 1 below summarizes the current and proposed deaveraging methodologies.

Table 1

Comparison of Current and Proposed Deaveraging Methodologies

	Current Method	**AT&T Proposal**	**Verizon Proposal**	**Staff Proposal**
Level of Deaveraging	Wire Center	Wire Center	Wire Center	Wire Center
Cost Based (yes / no)	Yes	Yes	Yes	Yes
Cost Model	HM 3.1 *	HM 5.3	VZ Cost	Modified HM 5.3
Number of Zones	5	3	3	5
Method for Grouping Wire Centers	Eye-ball	minimize relative average deviation	Hybrid – eye-ball / minimize SSE **	minimize SSE **

* HM 3.1 was used to determine relative wire center cost estimates only. The HM 3.1 estimates were scaled to reflect Commission ordered rates.

** SSE is short hand for Sum of Squared Errors

Q. ARE THE METHODS FOR GROUPING WIRE CENTERS INTO ZONES ACTUALLY DIFFERENT AND CAN ONE METHOD BE SUPERIOR TO ANOTHER?

A. Yes the deaveraging methodologies are different and the method proposed by AT&T for grouping wire centers into zones is superior by creating deaveraged zones that are most reflective of their underlying cost.

We can divide the wire center grouping methodologies into two categories, mathematical and non-mathematical approaches. The "eye-ball" approach is a non-mathematical approach. This approach involves looking at the data for breaks in loop cost to group wire centers into zones. This method was proposed in the initial Washington deaveraging proceeding and came under some criticism for its lack of precision. As deaveraging proceedings continued parties found the desire for deaveraging methodologies that were less dependent on the "eye of the beholder."

There are essentially two mathematical approaches before the Commission, the AT&T approach (minimize the overall weighted averaged deviation divided by the mean) and the Staff approach (minimize the overall weighted sum of squared errors).[5]

There are two differences between the AT&T and Staff approach. 1) The AT&T approach looks at average deviation[6], while the Staff approach looks at squared deviation.

[5] The Verizon approach is a combination of the eye-ball approach and the Staff approach.
[6] This is sometimes referred to as absolute deviation.

2) The AT&T approach measures deviation relative to the mean loop cost in each zone, while the Staff approach simply looks at deviation, without respect to the mean.

Q. WHAT IS THE DIFFERENCE BETWEEN AVERAGE DEVIATION AND SQUARED DEVIATION?

A. The difference between average and squared deviation is more easily understood by way of an example. Consider, for example, three wire centers with loop costs of $5, $10, and $15. The average costs (or mean) for these wire centers is $10 = (5 + 10 + 15) / 3.[7]

The average deviation is the sum of the absolute value difference of the cost for each wire center from the mean. That is: $|5 – 10| + |10 – 10| + |15 – 10| = 5 + 0 + 5 = 10$.[8]

The squared deviation is the sum of the squared difference of the cost for each wire center from the mean or: $(5 – 10)^2 + (10 – 10)^2 + (15 – 10)^2 = 25 + 0 + 25 = 50$.

Q. FOR PURPOSES OF DEAVERAGING, WHY IS MINIMIZING THE ABSOLUTE DEVIATION SUPERIOR TO MINIMIZING THE SQUARED DEVIATION?

A. First, it is important to be mindful of the goal. The deaveraging process places wire centers into deaveraged zones such that the zone cost is most representative of the underlying wire center loop cost. Second, the best way to do this is to place wire centers

[7] For simplicity sake, I've assumed that all wire centers have the same number of lines. Both the AT&T and Staff approach calculate weighted deviations, which take into account wire centers with different total lines.

[8] The symbols '| |' are used to represent the absolute value (i.e. the positive, as opposed to negative value) of the equation contained between the two bars.

into zones where the wire center cost is closest to the underlying zone cost. Third, the closest cost is determined by absolute cost differences, not squared cost differences. Thus, the goal is to minimize cost differences, not squared differences.

Q. STAFF AND VERIZON PROPOSE A DEAVERAGING APPROACH THAT MINIMIZES THE SUM OF SQUARED ERRORS. WHY IS THIS ILLCONCEIVED?

A. The approach that minimizes the sum of squared errors is simply not as accurate as the approach that minimizes the sum of absolute deviations. Econometrics most popular method is ordinary least squares ("OLS") where equations are fit to a set of data by minimizing the sum of squared errors. However, the popularity of the squared error approach is due, at least in part, to its mathematical ease. It is a lot easier to differentiate squares than it is absolute values. Differentiation is essential in the minimization process and the calculation of the OLS estimators. In addition, matrix algebra lends itself well to performing calculations on sum of squared (or multiplied) lists of data, but is not so convenient for dealing with absolute values.

Moreover, the tendency to default to minimizing squared errors is due in part to the ease of the mathematics surrounding this approach. This was especially the case when computations were time consuming and computing power much more limited. Today however, at least for this issue, there is no mathematical reason to restrict policy decisions to the "least squares" approach. The mathematics and computational power required to perform a minimization of absolute deviations as it applies to deaveraging, is simple and easily within our grasp.

Q. CAN YOU PROVIDE AN EXAMPLE OF WHY IS SQUARING THE DIFFERENCE IS AN INFERIOR TECHNIQUE?

A. Yes. I will show by example how squaring differences places undue weight on larger differences. Consider the case of two wire centers, one with an absolute difference in wire center cost from the zone cost of $1 and the other with an absolute difference of $2. The AT&T approach, (minimize absolute differences), places twice the weight on the second wire center as the first. This is logical because the second wire center has twice the absolute deviation as the first. However, the square approach would show differences of 1 and 4 (2 squared). Thus, the second wire center would have four times the weight as the first wire center in the approach that minimizes squared errors, even though its deviation from the zone cost is only twice that of the first wire center. There is no need or value gained in the deaveraging process by distorting deviations.

Q. DR. BLACKMON CLAIMS THAT THE AVERAGE DEVIATION APPROACH USED BY AT&T IS LESS EFFICIENT THAN THE SQUARE OF THE ERROR APPROACH USED BY STAFF. WHAT IS YOUR RESPONSE?

A. Dr. Blackmon's reasoning is circular. . "Efficiency," as used by Dr. Blackmon and statistical texts, refers to the variance of an estimate. One estimator is said to be more efficient than another estimator if it has a lower variance. Variance, in turn, is measured by squaring the deviations. Thus, it should surprise no one that an estimator, the purpose of which is to minimize squared deviations would have a lower variance than one that minimizes absolute deviations. Variance is one measure of deviation but, in and of itself,

tells nothing of the virtue of these two estimators for the purpose of assigning wire centers to deaveraged zones.

Q. YOU STATED THAT THE SECOND MAJOR DIFFERENCE BETWEEN THE AT&T AND STAFF APPROACH IS WHETHER ONE ANALYZES SIMPLE DEVIATION, OR DEVIATION RELATIVE TO THE MEAN. FOR THE PURPOSE OF DEAVERAGING, WHY IS IT IMPORTANT TO ANALYZE DEVIATION IN RELATION TO THE MEAN, RATHER THAN SIMPLY THE DEVIATION?

A. Each wire center's cost is estimated by detailed cost models, but because not all parameters are known with perfection, cost models make general assumptions that apply to the models' estimates. While these assumptions may be accurate on average for wire centers in a study area, they may prove to be approximations of the particular characteristics of an individual wire center. As a result, each wire center cost is an estimate rather than an exact measure. If an assumption produces accurate results on average, then a cost model's results can be said to be unbiased, even though some deviations from true cost may exist in individual wire center cost estimates. If an assumption causes cost estimates to over or understate costs, then the assumption can be said to bias results.

An important question, therefore, is: How are a cost models' deviations, whether biased or unbiased, related to a wire center's underlying costs? In other words, are high cost wire centers likely to have higher deviations? In econometrics a correlation between the size of a variable and the errors of an equation are known as heteroskedasticity. While

heteroskedasticity does not cause biased estimates, it does undermine the efficiency[9] of an estimator.

Q. WOULD YOU EXPECT COST MODELS' ESTIMATED DEVIATIONS TO BE CORRELATED WITH THE OVERALL SIZE OF THE LOOP COST ESTIMATE?

A. Yes. Most significant inputs into the cost models impact costs in proportion to total loop cost estimates, rather than on a simple dollar basis. For example, raising the cost of structure by $1 per foot will have a larger dollar per loop impact on a high cost area than a low cost area. This is because high cost wire centers are typically high cost due to long distances necessary to connect relatively few customers together. Many expense factors used in the cost models are applied based on direct cost. Because high cost wire centers have higher direct cost per line, these wire centers receive a larger share of the expenses. For example, a 5 percent factor applied to $10 of direct cost is $0.50, while the same factor applied to $100 of direct cost is $5.00.

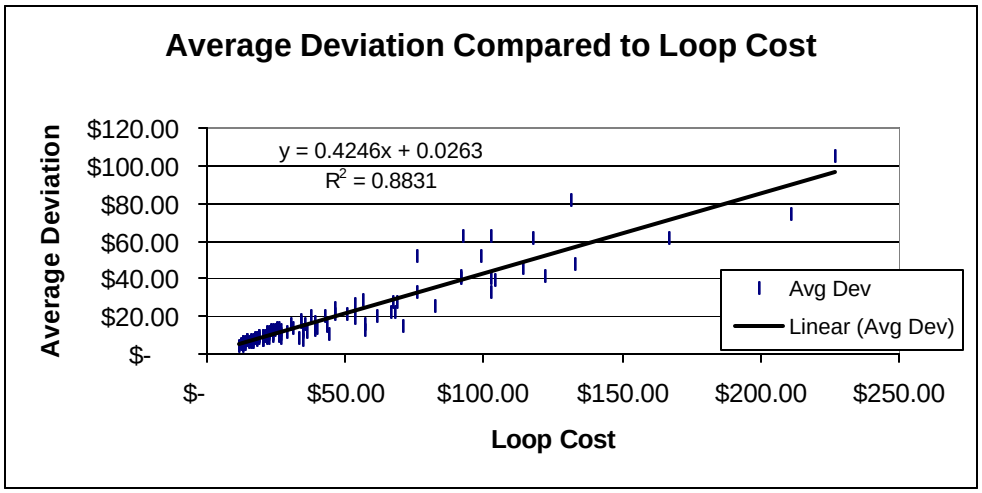
As a result, wire center cost differences should be analyzed on a relative, rather than absolute basis. In other words, a $5.00 per line difference in loop cost should be interpreted differently depending on whether the average zone price is, say, $10.00 versus $100.00.

Q. DO YOU HAVE ANY EVIDENCE THAT HIGH COST WIRE CENTERS HAVE HIGHER DEVIATIONS IN THEIR LOOP COST ESTIMATES?

[9] I am using efficiency here in the same way it is used by Dr. Blackmon in his testimony.

A. Yes. Chart 1 below shows the relationship between average loop costs and average deviation. To produce this chart I took loop cost estimates from HAI, VZ Cost, Staff and the FCC Synthesis Model for each Verizon wire center[10]. Based on these estimates I calculated the average loop cost and average deviation for each wire center and plotted them on the chart below. The dots on the chart represent the data points of Loop Cost and Average Deviation. The straight line in the chart is the trend line estimated, using OLS, for this data. As can be seen, as loop cost estimates increase, so also does the average deviation in loop cost estimates.[11] Thus, as expected, higher cost wire centers have higher dollar deviations in their cost estimates.

Chart 1



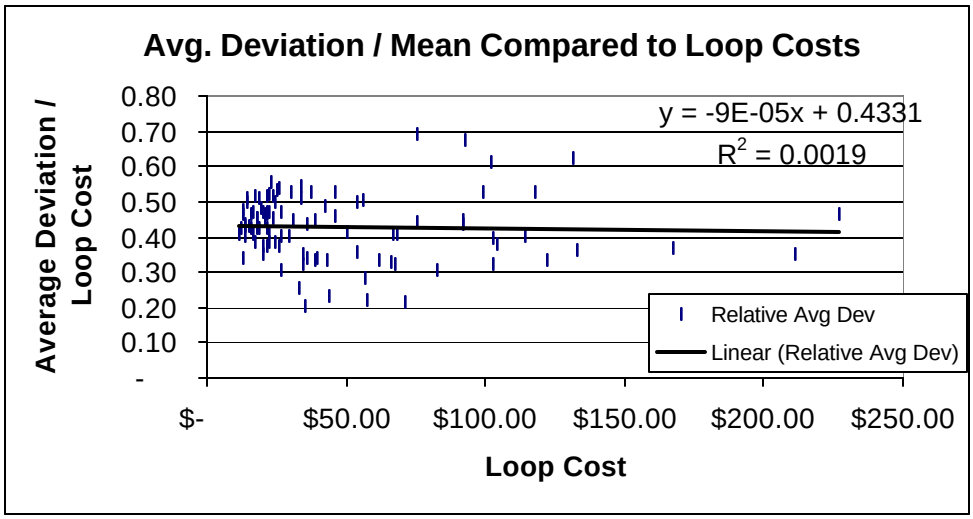
[10] The FCC Synthesis Model did not have wire center results for all Verizon wire centers. I used the results where they existed, with the exception of STPSWAXA. The FCC results for this wire center were uncharacteristically high and thus I removed the data as an anomaly. However, including this data point would not change the clear conclusions from this chart.

[11] Although I used average deviations to make the point, the results hold whether you look at average or standard deviations, and the chart looks strikingly similar.

Q. HOW CAN ONE ACCOUNT FOR THE FACT THAT HIGHER COST WIRE CENTERS ARE LIKELY TO HAVE HIGHER ESTIMATED LOOP COST DEVIATIONS?

A. To properly account for the fact that high cost wire centers have higher deviations in their cost estimates, the deaveraging optimization approach should look at deviations relative to the mean loop costs in each deaveraged zone. This is precisely what the AT&T optimization program does. Chart 2 below shows that average deviation divided by the mean is fairly constant across wire center loop cost estimates.

Chart 2



Q. WHAT SHOULD THIS COMMISSION CONCLUDE FROM YOUR TESTIMONY?

A. All parties in the case agree on the key components of creating deaveraged zones for Verizon in that, loop costs should be deaveraged at the wire center level; and similar cost

wire centers should be grouped together into deaveraged zones. AT&T and Verizon believe that three zones are sufficient at this time in order to properly reflect loop cost differences for Verizon's wire centers in Washington.

While all parties use, at least in part, a similar mathematical approach to assigning wire centers to deaveraged zones, the approach recommended by AT&T *best* assigns wire centers to zones in a manner that is most reflective of their underlying cost.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.